


LC7215, 7215F, 7215FM
MW/LW PLL Frequency Synthesizers

Overview

The LC7215, LC7215F and LC7215FM are phase-locked-loop frequency synthesizer LSIs that provide accurate reference frequencies over the MW and LW bands, making them ideally suited for AM tuners.

Features

- PLL frequency synthesizer LSIs for MW and LW bands.
- Reference frequencies of 1, 5, 9 and 10 kHz.
- On-chip transistor for the low-pass filter amplifier.
- Single output pin (CMOS output)
- Controller clock output pin.
- Time-base output pin.
- All devices can be used for double conversion demodulation.
- The LC7215F and 7215FM have expanded input frequency ranges.

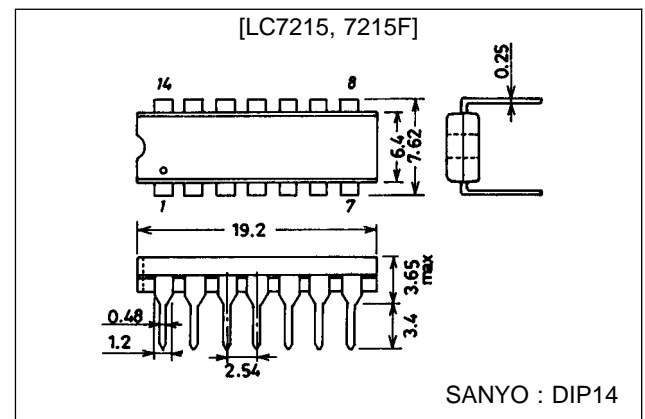
LC7215 0.5 to 13 MHz : (DIP14)

LC7215F/FM 0.5 to 20 MHz : (DIP14/MFP14S)

Package Dimensions

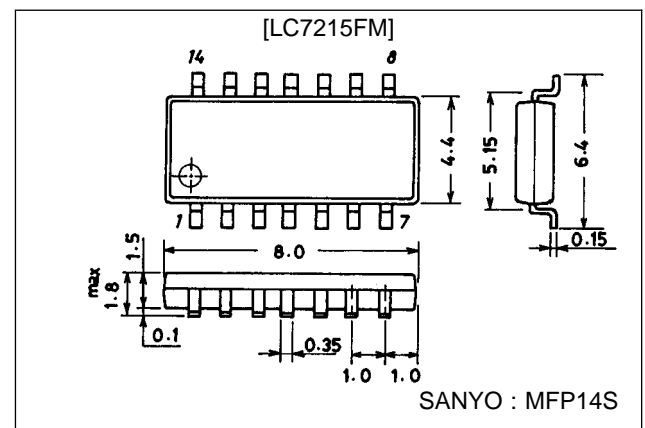
unit : mm

3003A-DIP14



unit : mm

3111-MFP14S



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Specifications

Absolute Maximum Ratings at $T_a = 25^\circ\text{C}$, $V_{SS} = 0\text{ V}$

Values in parentheses are for the LC7215F and LC7215FM.

Parameter	Symbol	Conditions	Ratings	Unit
Maximum supply voltage	$V_{DD\text{ max}}$	V_{DD}	-0.3 to +6.5	V
Input voltage	V_{IN1}	All input pins	-0.3 to $V_{DD} + 0.3$	V
	V_{IN2}	CE, CL, DATA	(Note) -0.3 to +6.5	V
Output current	I_{OUT}	AOUT	0 to 5	mA
Output voltage	V_{OUT1}	AOUT	-0.3 to +15	V
	V_{OUT2}	\overline{SYC} , \overline{TB}	-0.3 to +6.5	V
	V_{OUT3}	All output pins except V_{OUT1} and V_{OUT2}	-0.3 to $V_{DD} + 0.3$	V
Allowable power dissipation	$P_d\text{ max}$	$T_a \leq 85^\circ\text{C}$	150	mW
Operating temperature	T_{opr}		-40 to +85	$^\circ\text{C}$
Storage temperature	T_{stg}		-55 to +125	$^\circ\text{C}$

Note: Voltage that is applied to the resistors when resistors totaling at least 10 k Ω are connected to a pin in series.

Allowable Operating Conditions at $V_{SS} = 0\text{ V}$

Values in parentheses are for the LC7215F and LC7215FM.

Parameter	Symbol	Conditions	min	typ	max	Unit
Supply voltage	V_{DD1}	V_{DD}	(4.5)3.0		(5.5)5.5	V
	V_{DD2}	V_{DD} (Crystal OSC oscillation guaranteed)	3.0		5.5	V
High-level input voltage	V_{IH}	CE, CL, DATA	2.0		V_{DD1}	V
Low-level input voltage	V_{IL}	CE, CL, DATA	0		0.5	V
Output voltage	V_{OUT1}	AOUT			13	V
	V_{OUT2}	\overline{SYC} , \overline{TB}			5.5	V
Input frequency	f_{IN1}	PIN: Sine wave, capacitive coupling V_{DD1} , *S = 1	(2.3)2.3		(20)13	MHz
	f_{IN2}	PIN: Sine wave, capacitive coupling V_{DD1} , *S = 0	0.5		2.5	MHz
Oscillation guaranteed crystal oscillator	X'tal	XIN, XOUT: $C_I \leq 30\ \Omega$	8.00	11.16	12.00	MHz
Input amplitude	V_{IN1}	PIN: Square wave, capacity connection V_{DD1} , *S = 1	100		1000	mVrms
	V_{IN2}	PIN: Square wave, capacity connection V_{DD1} , *S = 0	100		1000	mVrms
Power supply	—	V_{DD} , V_{SS} : A capacitor of at least 1000 pF must be inserted.	1000			pF

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Electrical Characteristics within the allowable operating ranges

Values in parentheses are for LC7215F and LC7215FM.

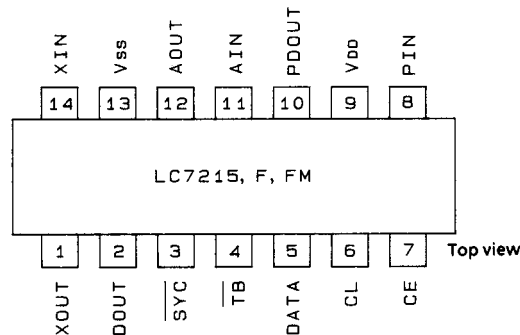
Parameter	Symbol	Conditions	min	typ	max	Unit
High-level input currents	I _{IH1}	XIN: V _I = V _{DD}			20	μA
	I _{IH2}	PIN: V _I = V _{DD}			40	μA
	I _{IH3}	CE, CL, DATA: V _I = V _{DD}			3.0	μA
	I _{IH4}	AIN: V _I = V _{DD}		0.01	1.0	μA
Low-level input currents	I _{IL1}	XIN: V _I = V _{SS}			20	μA
	I _{IL2}	PIN: V _I = V _{SS}			40	μA
	I _{IL3}	CE, CL, DATA: V _I = V _{SS}			3.0	μA
	I _{IL4}	AIN: V _I = V _{SS}		0.01	1.0	μA
High-level output voltages	V _{OH1}	DOUT: I _O = 1 mA	V _{DD} -1.0			V
	V _{OH2}	PDOUT: I _O = 0.5 mA	V _{DD} -1.0			V
Low-level output voltages	V _{OL1}	DOUT: I _O = -1 mA			1.0	V
	V _{OL2}	PDOUT: I _O = -0.5 mA			1.0	V
	V _{OL4}	SYC, TB: I _O = 0.5 mA			1.0	V
	V _{OL5}	AOUT: I _O = 1 mA			1.0	V
Output off-state leakage currents	I _{OFF1}	SYC, TB: V _O = V _{DD}			3.0	μA
	I _{OFF2}	AOUT: V _O = 13 V			5.0	μA
Tristate output High-level off-state leakage current	I _{OFFH}	PDOUT: V _O = V _{DD}		0.01	1.0	nA
Tristate output Low-level off-state leakage current	I _{OFFL}	PDOUT: V _O = V _{SS}		0.01	1.0	nA
High-level output voltage	V _{OH3}	XOUT: I _O = -0.1 mA	V _{DD} -1.0			V
Low-level output voltage	V _{OL3}	XOUT: I _O = 0.1 mA			1.0	V
Supply current	I _{DD1}	V _{DD} : f _{IN1} = 13 MHz, *S = 1 (High speed) (Note 1)			10	mA
		f _{IN1} = 20 MHz, *S = 1 (High speed) (Note 1)			(12)	mA
	I _{DD2}	V _{DD} : f _{IN1} = 2.5 MHz, *S = 0 (Low speed) (Note 1)			5	mA
	I _{DD3}	V _{DD} : V _{DD} = 5.5 V, *O = 0, P = 1 (Note 2)		1.2	2.0	mA
		V _{DD} : V _{DD} = 4.5 V, *O = 0, P = 1 (Note 2)		0.7	1.5	mA
V _{DD} : V _{DD} = 3.0 V, *O = 0, P = 1 (Note 2)			0.4	1.0	mA	

* S, O and P are serial control bits.

Note 1. V_{IN1} = V_{IN2} = 100 mVms. The 11.16 MHz crystal is connected to XIN and XOUT. All other inputs are connected to V_{SS} and all other outputs are open.

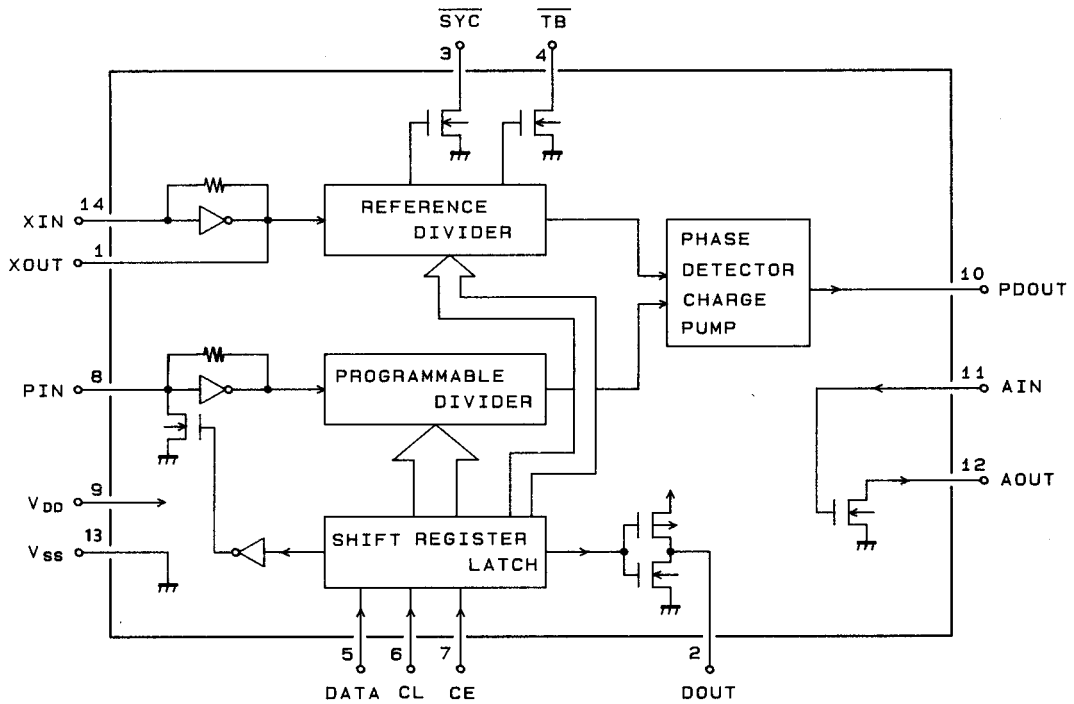
2. The 11.16 MHz crystal is connected to XIN and XOUT. All other inputs are connected to V_{DD} and all other outputs are open. (Backup mode when PLL is halted.)

Pin Assignment



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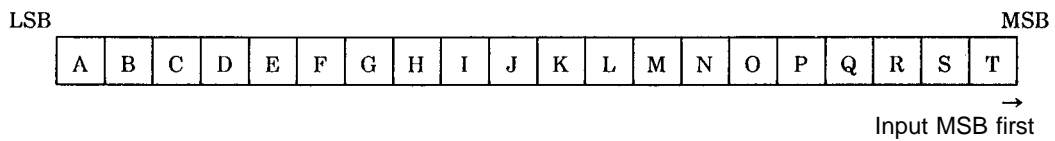
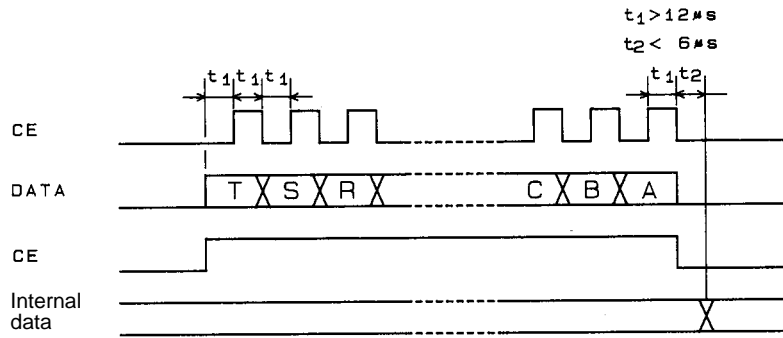
Block Diagram



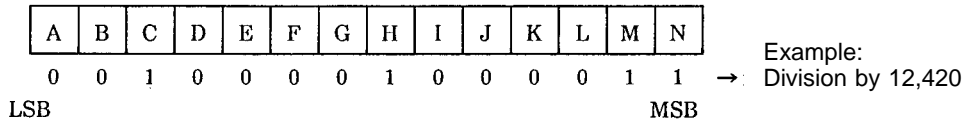
Pin Description

Name	Description
XIN, XOUT	11.16 MHz crystal oscillator connection, feedback resistance built-in
PIN	Local oscillator signal input
V _{DD} , V _{SS}	Power supply
DATA, CL, CE	Data input
DOUT	Single bit data output
AIN, AOUT	Low-pass filter amplifier
PDOUT	Charge pump output
T \bar{B}	8 Hz time-base output
S $\bar{Y}C$	60 kHz controller clock output

Data Input



(1) A to N: Divider data



(2) O, P: Mode selection

Mode	O	P	DOUT	TB	Operation
NOR1	0	0	T	8 Hz	Normal operation (with PLL operating)
NOR2	0	1	T	8 Hz	Normal operation (backup when PLL is halted)
TEST1	1	0			(Device test mode)
TEST2	1	1			(Device test mode)

(3) Q, R: Reference frequency selection

Q	R	Reference frequency
0	0	9 kHz
0	1	10 kHz
1	0	1 kHz
1	1	5 kHz

(4) S: Programmable divider input sensitivity switch

S = 1: for High speed
S = 0: for Low speed

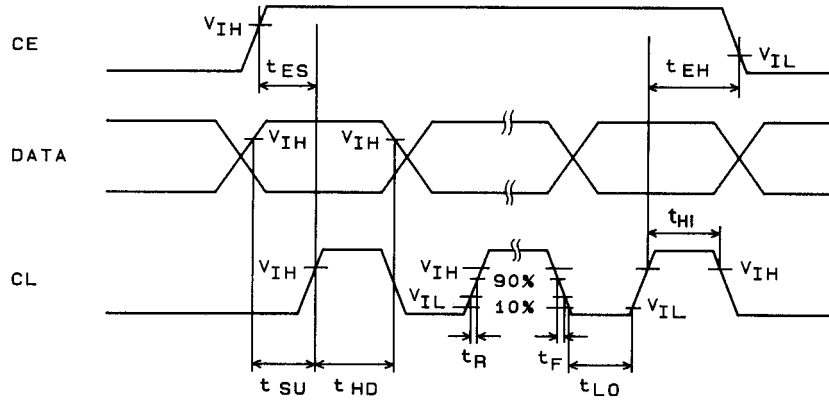
(5) T: Output to DOUT

T = 1: DOUT = 1
T = 0: DOUT = 0

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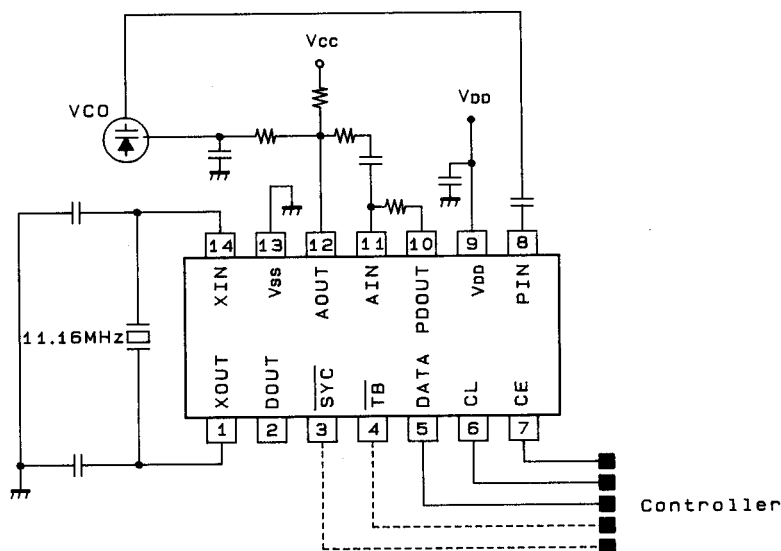
Data Input Timing

$V_{IH} = 2.0$ to V_{DD} , $V_{IL} = 0$ to 0.5 V
 $X'tal = 8.00$ to 11.16 (typ) to 12.00 MHz
 Data latch: Rising edge of CL

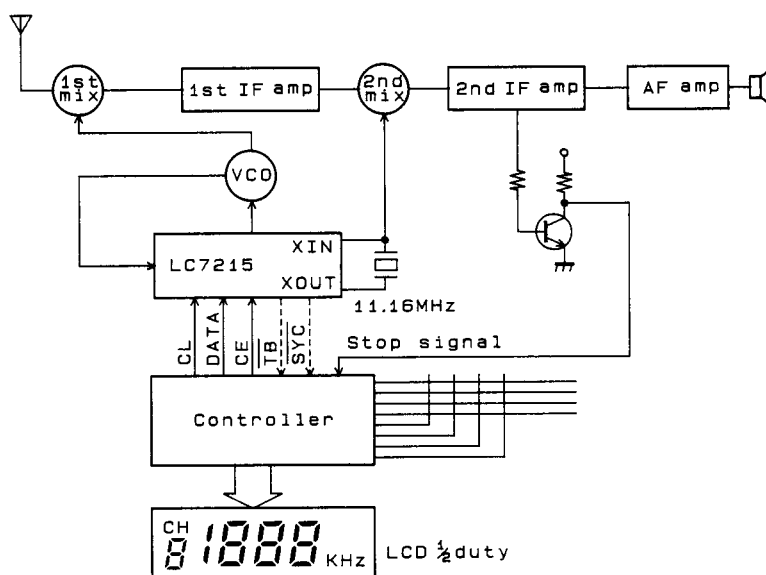


Item	Symbol	11.16 MHz crystal	Other crystal frequencies	Effective value
Enable setup time	t_{ES}	At least 12 μs	At least $2 \times (1/f_{Xtal} \times 62)$	1/2 of the value shown at left
Enable hold time	t_{EH}	↑	↑	
Data setup time	t_{SU}	↑	↑	
Data hold time	t_{HD}	↑	↑	
Clock Low-level time	t_{LO}	↑	↑	
Clock High-level time	t_{HI}	↑	↑	
Rise time	t_R	1 μs or less	1 μs or less	
Fall time	t_F	↑	↑	

(1) Sample Application Circuit



(2) Double-conversion Receiver



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